

CHAPTER 6

RETROFIT OF EXISTING HVAC CONTROL SYSTEMS

1. INTRODUCTION. When determining whether to retain or replace existing control systems (in whole or in part) in the retrofit of existing HVAC systems, the designer must evaluate the applicability of the design guidance provided in this manual. The reason for this evaluation is that deviation from this guidance may be necessary in certain circumstances to prevent adverse impacts on the operation and performance of the retrofitted HVAC systems. Examples of control system situations that require such evaluation are as follows:

a. Reuse of existing valves, where their sizes may affect the existing or new hydronic systems and their pump sizing.

b. Reuse of existing dampers, where their sizes may affect the existing or new air handling systems and their fan sizing.

c. Replacing three-way valves with two-way valves and vice versa and its effect on hydronic systems and their pump sizing.

d. Partial retrofit, where only the final elements such as dampers, valves, and operators may be left in place.

e. Retrofits involving economizer control loops.

f. HVAC systems that may not match the systems shown in Chapter 4 or their variations in Chapter 5.

2. VALVE SIZING AND ITS EFFECT ON HYDRONIC SYSTEMS. Quite likely the guidance provided in this manual for the sizing of control valves differs from the design criteria on which the existing control valves (in a retrofit project) were selected. Consequently, the designer must compare the pressure drop across the existing control valve with the pressure drop for a control valve based on the sizing requirements of this manual. If the existing valve sizes do not meet the pressure drop requirement for sizing valves in accordance with this manual, it may be that the sizing of the existing valves was based on pressure drop through the valves lower than required by the manual. The designer must then determine if the existing pumping system can provide adequate flow throughout the system with new valves (sized in accordance with this manual) in place. If not, the existing pumping system will have to be upgraded or replaced if the valve sizing pressure drop guidance of this manual is applied.

3. DAMPER SIZING AND ITS EFFECT ON AIR HANDLING SYSTEMS. Evaluation of control dampers in a retrofit project is similar to control valve evaluation, because changing the size of an existing damper would change the damper's pressure drop and in turn affect fan air volume delivery. Also, the damper actuators might have to be retrofitted if the evaluation shows a change in the damper's pressure drop.

4. REPLACEMENT OF 3-WAY AND 2-WAY VALVES. Whenever there is a change in the type of control valve in a retrofit project (either from a 2-way valve to a 3-way valve or vice versa), the designer must make additional pressure and flow evaluations. If the change is from 3-way to 2-way, the pressure could increase significantly with a significant pumping system flow decrease as the valve closes. Conversely, the change from 2-way to 3-way could cause significant pressure decrease and flow

increase. In either case, there could be adverse effects on HVAC system performance. The designer must evaluate and account for the new pressure drops in deciding whether to change the type of valve.

5. RETROFIT PROJECTS WHERE ONLY FINAL ELEMENTS MAY BE LEFT IN PLACE. Some HVAC retrofit projects may involve new controls, but may not require replacement of existing primary elements such as dampers, valves, sensing elements, or other measurement devices. In such instances, the designer must insure that the control signals (both input and output) and actuators for the final elements are in accordance with the design guidance provided in this manual.

6. RETROFITS INVOLVING ECONOMIZER CONTROL LOOPS. If an HVAC system with an economizer mode of operation is to be retrofitted, or if an economizer mode is to be added to an existing HVAC system, the economizer components must be in accordance with the guidance described in the manual.

7. RETROFIT PROJECTS INVOLVING HVAC SYSTEMS NOT COVERED IN THIS MANUAL. When an individual HVAC control system not shown in this manual requires upgrading, it may not be feasible nor suitable to follow the guidance of this manual. It is most likely that maintaining consistency with the remainder of the control system is of more value. It is the responsibility of the designer to evaluate existing conditions to determine the suitability of following the guidance of this manual.

8. GENERAL CONSIDERATIONS FOR RETROFIT PROJECTS.

- a. Only electric or electronic terminal unit controls, if serviceable, may be reused.
- b. No existing pneumatic controls except pneumatic valve actuators and damper actuators, if serviceable, may be reused.
- c. If pneumatic actuators are to be reused and the designer finds that their use is justified on the basis of life-cycle cost, the existing air compressors and related accessories, if serviceable, may be reused.
- d. Electric or electronic HVAC control systems with standard signal levels (i.e., 4-20 ma) if serviceable, may be reused.
- e. If existing HVAC systems are retrofitted with control systems designed in accordance with this TI, extension of EMCS to such HVAC systems will interface with the control system as shown in this TI.